portion of the water from such storms appears as surface flow, overflowing banks and causing damage in the vicinity of the storm area, but farther down stream it may be of decided help in increasing the available water supply.

As already noted, the rainfall in the great interior basin and thruout the northern Plateau is relatively small during the growing season, so that the run-off during late summer is supplied principally by ground waters, augmented somewhat by the melting of ice in sheltered spots at high altitude. On the southeastern slope, where the spring is almost rainless, the maximum run-off comes in May and the early part of June, but following the decline of the flow the rainy season sets in; sometimes it begins as early as July 1. Over many drainage areas of the eastern slope the amount of land under ditch is so great that the supply of water from melting snow becomes wholly inadequate in the latter part of the season, even when the snowfall of the preceding winter has been much in excess of the normal; for this reason the amount and distribution of the summer rains becomes a deciding factor.

Conditions that prevailed in Colorado several years ago furnish a good illustration of the principles enumerated. During the closing months of 1898 the snowfall along the Continental Divide and adjacent regions in Colorado was greater than had been experienced for many years. January, 1899, added 15 per cent and February a like amount, stormy weather being almost continuous, with plenty of wind to sweep the snow into the gulches and ravines. March, 1899, was even wetter than any of the four preceding months. As compared with the stupendous amounts that fell during that season, the next winter, that of 1899–1900, was dry, especially during January and March, tho October contributed a heavy fall, and February less than the normal amount for the region as a whole. It thus appears that the successive winters were notably different. The spring of 1899 was practically rainless, that of 1900 exceptionally wet. The summer of 1899 had slightly more than the normal precipitation, while the summer of 1900 was droughty. We now come to the water supply: the volume available on the eastern slope during the spring and summer of 1899 was inadequate, except for a brief period in June, notwithstanding the stupendous amount of snow that fell during the preceding winter. In 1900 irrigation enterprises fared better during spring and part of summer, despite the light snowfall of the preceding winter. The anomaly is explained by the fact that in consequence of the long, dry period which preceded the stormy winter of 1898–9, the ground was dry and unfrozen when the first snow fell, hence it absorbed a vast amount of moisture when melting began. The unusual dryness during spring played an important part, for, as is usual in droughty times, high winds, desiccating in character, were almost continuous, honeycombing the snow and causing a large proportion to disappear as if by magic. When the winter of 1899–1900 set in the ground was well supplied with moisture and frozen, as a rule, so that in the spring, which was notably free from high winds, the run-off reached the streams with comparatively little loss, and being augmented by seepage from the unprecedented fall of rain and melted snow during April (about ten inches) a most satisfactory flow was maintained until about the middle of July.

PHENOMENAL RAINFALL AT GUINEA, VA.

By E. A. EVANS, Section Director. Dated Richmond, Va., September 26, 1906.

On the 24th of August, 1906, there occurred at Guinea (P. O. Guineys), Caroline County, Va., a phenomenal fall of rain within a short period of time. Guinea is a station on the line of the Richmond, Fredericksburg, and Potomac Railroad [see *A* on the accompanying fig. 1], and the measured amount of rain of 9¼ inches in about thirty minutes was made there by Mr. W. M. Jones, foreman in the roadway department of this railroad, and by him reported to the President, Judge Wm. J. Leake, who subsequently placed the information in the hands of the writer. Mr. Jones is vouched for in the highest terms by his official superiors as a careful and accurate man, and has the confidence of all who know him.

Being much interested in establishing the facts regarding this enormous rainfall, I visited Guinea on September 3, and obtained the following information.

There were three measurements of rainfall made, one by Mr. Jones, in which instance the rain was caught in a tin bucket 9¼ inches deep and 8¾ inches in diameter, top and bottom. This bucket stood on a bench [*1*] in the yard and near the house [*B*] of Mr. Jones. The bench was 8 feet from the nearest part of the house and the bucket was about 20 inches above the ground. The exposure was such that only the rain falling from the sky could be caught. Mr. Jones states most positively that there was no water in the bucket before the rain set in.

The remaining two measurements were made [at *2* and *3*] by Mr. C. W. Tompkins, living about one mile north of Guinea. The first of these was taken from a wooden bucket 12 inches deep, 12 inches in diameter at the top, and 11 inches in diameter at the bottom, inside measure, and the last from two tin milk pails, 7½ inches deep and 11 inches in diameter, and 10 inches deep and 12 inches in diameter, respectively. These [two tin] pails had straight sides, were on the ground in an open pasture, and were placed one inside of the other.

The term "measurements" applies only indirectly, as there were no actual measurements taken at the time, the buckets being in each instance full and overflowing. The dimensions of the bucket at Mr. Jones's house were taken by the writer, while the dimensions of those at Mr. Tompkins's place were taken and reported by him. It is proper to say here that Mr. Tompkins is a man of standing in his community, and his responsibility is established and unquestioned.

Aside from the information furnished by Judge Wm. J. Leake, the details of this storm, as gathered by the writer, were obtained from various persons at Guinea, but chiefly from Messrs. Jones and Tompkins. They are as follows:

Weather before the storm very sultry, sky overcast, but not very threatening; thunder first heard about 4:30 p. m.; as the storm approached lightning became severe; rain began about 5:30 p. m.; about this time two heavy clouds met, one moving from the west, and the other from the northeast, and the rain immediately fell in torrents; according to Mr. Jones, corroborated by other witnesses, "it did not rain, but just poured down in solid sheets"; wind light; this condition lasted about thirty minutes, according to Mr. Jones—other eye witnesses make the time from five to ten minutes more—and then ceased, but light rain continued, ending about 6:30 p. m.; thunder last heard about 5 p. m.; the storm came from the west and moved almost due northward from Guinea; no rain of consequence fell 1½ miles east of Guinea.

Mr. Jones states that before the heavy rain ended he saw the railroad embankment, at a point marked *4* on fig. 1, beginning to wash away. He left his house to wire the railroad officials to hold trains, and passing by the bench on which the bucket first mentioned stood, he saw that it was full of water and running over. It continued raining very hard for some time afterward, according to his statement, and subsequently the second washout at the point marked *5*, on fig. 1, occurred.

After the rain, a work train was sent to the gravel bank at *D*, fig. 1, to get material to repair the embankment, but this track was under water and they could not get in. The washout had to be filled with cross ties, Mr. Jones stated.

Mr. Tompkins statement is as follows:

I was in my barn when the storm came up. It came from the direction of Guinea. Before I could get ready to leave the barn it was raining so hard that I was afraid to venture out. The storm lasted about forty-five minutes and after it was over I waded thru six inches of water on the level ground to get to my house [*C*]. In my yard on the north side of the house, but not adjacent to it, nor to any shed, was a wooden bucket [at *2*; the dimensions as previously given were taken subsequently at the request of the writer], which was full to the brim and running over. How much ran over I could not tell. I know the bucket was empty before the storm.

Just before the storm my sons started for the pasture to milk the cows. They reached the pasture about the time the storm came up, and ran to the house for shelter, leaving the pails on the ground in the field [at *3*], one being inside of the other. After the rain, when they went back, both inner and outer pails were full and running over.

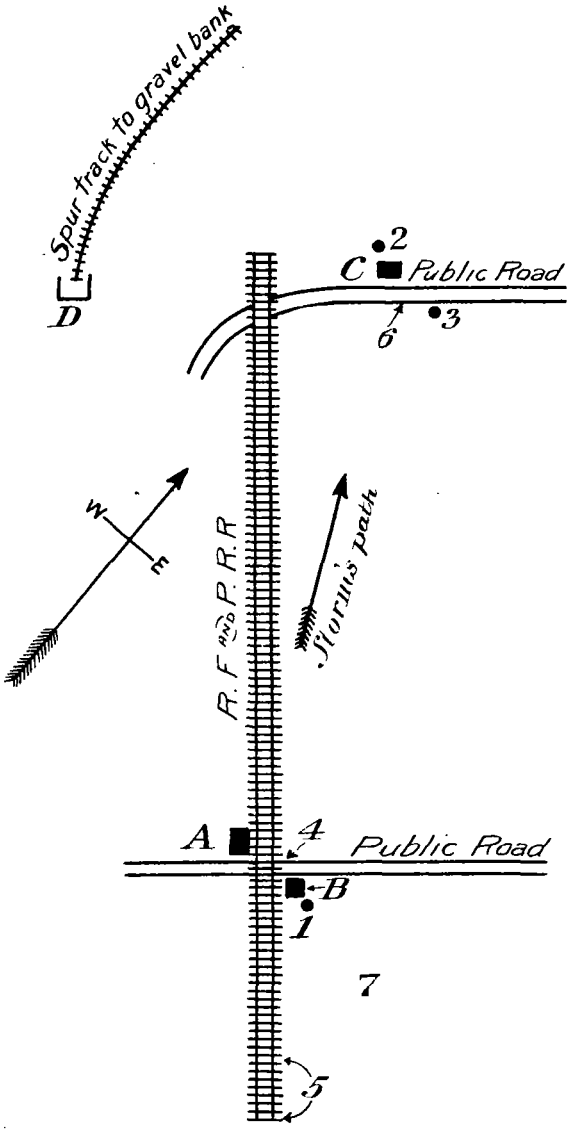

FIG. 1.—The immediate neighborhood of Guinea, Va., showing location of the washouts and of the exposed buckets.

Time did not admit the writer's seeing any of these buckets, or the points where they were exposed.

Collateral evidence of an enormously heavy rainfall was obtained from various sources. The most important instances are given in the following paragraphs:

From the railroad station southward, a distance of perhaps a quarter of a mile, the tracks run along the top of an embankment which is from four to eight feet high. The rainfall on this embankment submerged the rails, and was running off on either side. In less than an hour, and beginning at a point where a three-foot culvert passes under the track, about fifty feet of this embankment was washt out. Near the station [at *4*], a large hole was washt in the embankment under the north-bound track. At *6* the public road was washt out.

The posts of a fence inclosing a small meadow [*7*] on the east side of the railroad embankment mentioned, were submerged. These posts are from four to five feet high. The meadow is small and receives the drainage from, perhaps, ten or twelve acres of land.

An ordinary garden gate made of pickets, at the foot of the path leading from Mr. Jones's house to the public road, was torn from its hinges by the force of the water passing thru it. The ground falls somewhat from the house to this gate.

At the time of the writer's visit to Guinea, grass, weeds, and bushes still bore mud stains, and in one instance a high-water mark was noted on a small tree in the meadow just mentioned. The mark was about four feet above the ground.

By means of correspondence, an effort has been made to trace the path of the storm. This effort has been only partially successful, but has resulted in the establishment of the following facts, (see fig. 2):

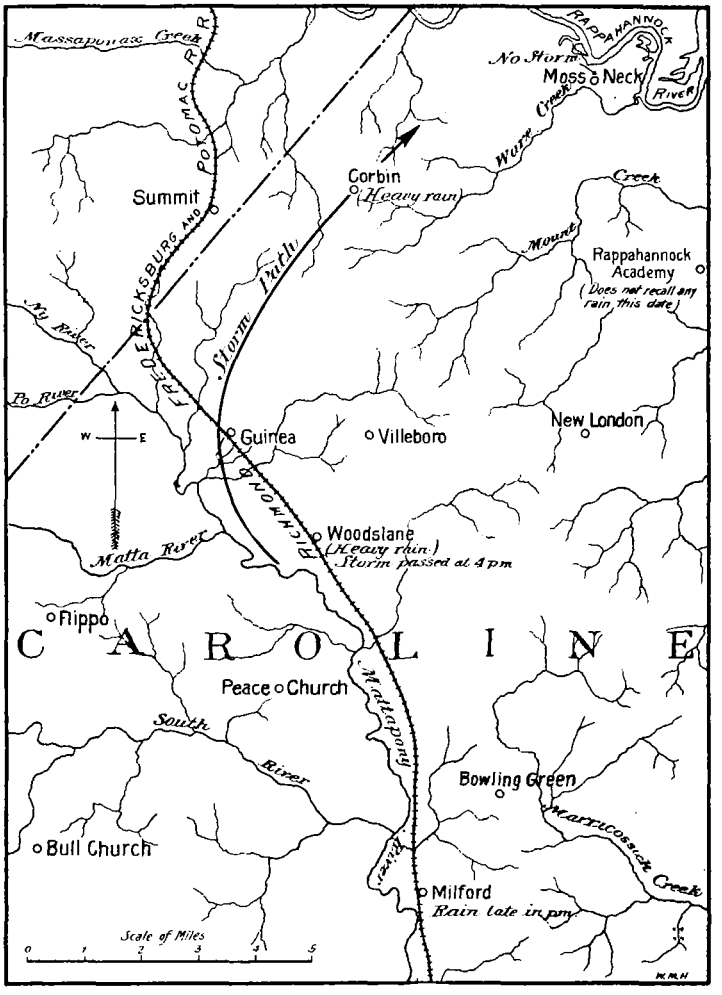

FIG. 2.—The region around Guinea, Caroline County, Va., showing where the storm was felt.

At 4 p. m. the storm passed over Woodslane, Woodford P. O., about four miles south of Guinea, accompanied by thunder and heavy rain. After leaving Guinea it turned northeastward, and passed over Corbin, a village about six miles northeast of Guinea, accompanied by heavy rain, thunder and lightning. The time at Corbin was not taken, but was late in the afternoon. The storm did not reach any point beyond Corbin.

It is interesting to note that on this date in an area extending from Milford, Caroline County, up the line of the Richmond, Fredericksburg, and Potomac Railroad, to Washington, D. C., numerous severe local storms occurred; and unusually heavy rains, accompanied by thunder and lightning, and in some instances high winds, were reported by the railroad station agents at Brooke and several other points, up to and including Washington, D. C. However, except at Summit, near Guinea, none of these storms can be connected with the Guinea "cloudburst" which, so far as can be ascertained, prevailed only within a very small area.